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REC'D 27 AUG 2004

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PCT

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

I also certify that the attached copy of the request for grant of a Patent (Form 1/77) bears an amendment, effected by this office, following a request by the applicant and agreed to by the Comptroller-General.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.

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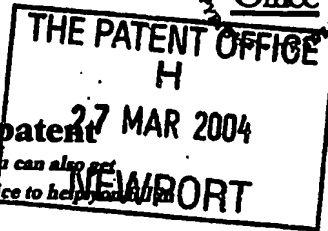
Signed

Dated

20 August 2004

Patents Form 1/77

Patents Act 1977
(Rule 16)



Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road
Newport
South Wales
NP10 8QQ

1. Your reference

PF 46

2. Patent application number

(The Patent Office will fill this part in)

27 MAR 2004

29MAR04 E884629-1 B23225
P01/7700 0.00-0406991.0 NONE

3. Full name, address and postcode of the or of each applicant (underline all surnames)

0406991.0

Patents ADP number (if you know it)

7947252003

If the applicant is a corporate body, give the country/state of its incorporation

Polatis Limited

4. Title of the invention

Compact Laser Marking system

5. Name of your agent (if you have one)

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

i.p.21 Limited
Norwich Research Park
Colney
Norwich NR4 7UT.

F51/n
7.5.01

Patents ADP number (if you know it)

8346694001

6. Priority: Complete this section if you are declaring priority from one or more earlier patent applications, filed in the last 12 months.

Country

Priority application number
(if you know it)

Date of filing
(day / month / year)

7. Divisionals, etc: Complete this section only if this application is a divisional application or resulted from an entitlement dispute (see note d)

Number of earlier UK application

Date of filing
(day / month / year)

8. Is a Patents Form 7/77 (Statement of inventorship and of right to grant of a patent) required in support of this request?

Answer YES if:

- a) any applicant named in part 3 is not an inventor, or
- b) there is an inventor who is not named as an applicant, or
- c) any named applicant is a corporate body.

Otherwise answer NO (See note d)

YES

Patents Form 1/77

9. Accompanying documents: A patent application must include a description of the invention. Not counting duplicates, please enter the number of pages of each item accompanying this form:

Continuation sheets of this form

Description 1 -

Claim(s) 1 -

Abstract

Drawing(s) 1 only JML

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 7/77) 1 -

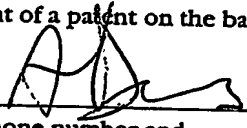
Request for a preliminary examination and search (Patents Form 9/77)

Request for a substantive examination (Patents Form 10/77)

Any other documents (please specify)

11. I/We request the grant of a patent on the basis of this application.

Signature(s)



Date 26-March-2004

12. Name, daytime telephone number and e-mail address, if any, of person to contact in the United Kingdom

ANDREW DAMES
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Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

Notes

- If you need help to fill in this form or you have any questions, please contact the Patent Office on 08459 500505.
- Write your answers in capital letters using black ink or you may type them.
- If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.
- If you have answered YES in part 8, a Patents Form 7/77 will need to be filed.
- Once you have filled in the form you must remember to sign and date it.
- Part 7 should only be completed when a divisional application is being made under section 15(4), or when an application is being made under section 8(3), 12(6) or 37(4) following an entitlement dispute. By completing part 7 you are requesting that this application takes the same filing date as an earlier UK application. If you want the new application to have the same priority date(s) as the earlier UK application, you should also complete part 6 with the priority details.

Compact laser marking system

What is described is a compact laser marking system, particularly suited for installing into pre existing manufacturing lines. A Dames 23. March 2004 Polatis Limited

Preferred embodiment

A Fibre laser source is coupled to a compact scan head derived from optical switch technology (WO 02/46825; WO 01/50176, **GB2372834A**); aimed at work pieces or product to be marked travelling underneath. A vector graphics driven alpha numeric font is used, corrected for both the dynamics of the scanner and the movement of the product past the scan head. Characters and lines are separated by turning the laser off between them.

Advantages include easy access to existing equipment from small diameter of scan head flexibility of the fibre; high quality ($M^2 \sim 1$) beam of low numerical aperture permits large depth of field – no field flattening lens needed. (picture 1)

Additional features include:

Varying the scan speed to provide the gaps in the marking, to avoid having to modulate the laser. This is done by scanning faster in the gaps.

Use of diverging lens in front of scanner (close up) to increase the number of resolvable pixels in the scan field. (picture 2)

Use of converging lens at a distance away from the scanner to create a parallel scanned beam, such that the font size is independent of target distance. (picture 3)

Camera linked to marking system to monitor marking performance by imaging finished text and adjusting parameters to keep text contrast & line width within limits, generates alert for service if running out of margin. Fine control of applied power density enables significantly finer lines to be drawn for a given spot size (as the process is non linear), especially with high beam quality gaussian beams.

Use of camera linked to marking system (or other sensor – eg ultrasonic) to measure marking distance, and automatically adjust scan size and speed (or beam power) to compensate.

Photo detector operating as a real time marking monitor, allows consistent marking over highly variable surfaces. Can monitor either the smoke or combustion generated at the marking point, or the reflectivity / colour of the mark immediately behind the marking point. Beam power adjusted in real time to ensure consistent marking.

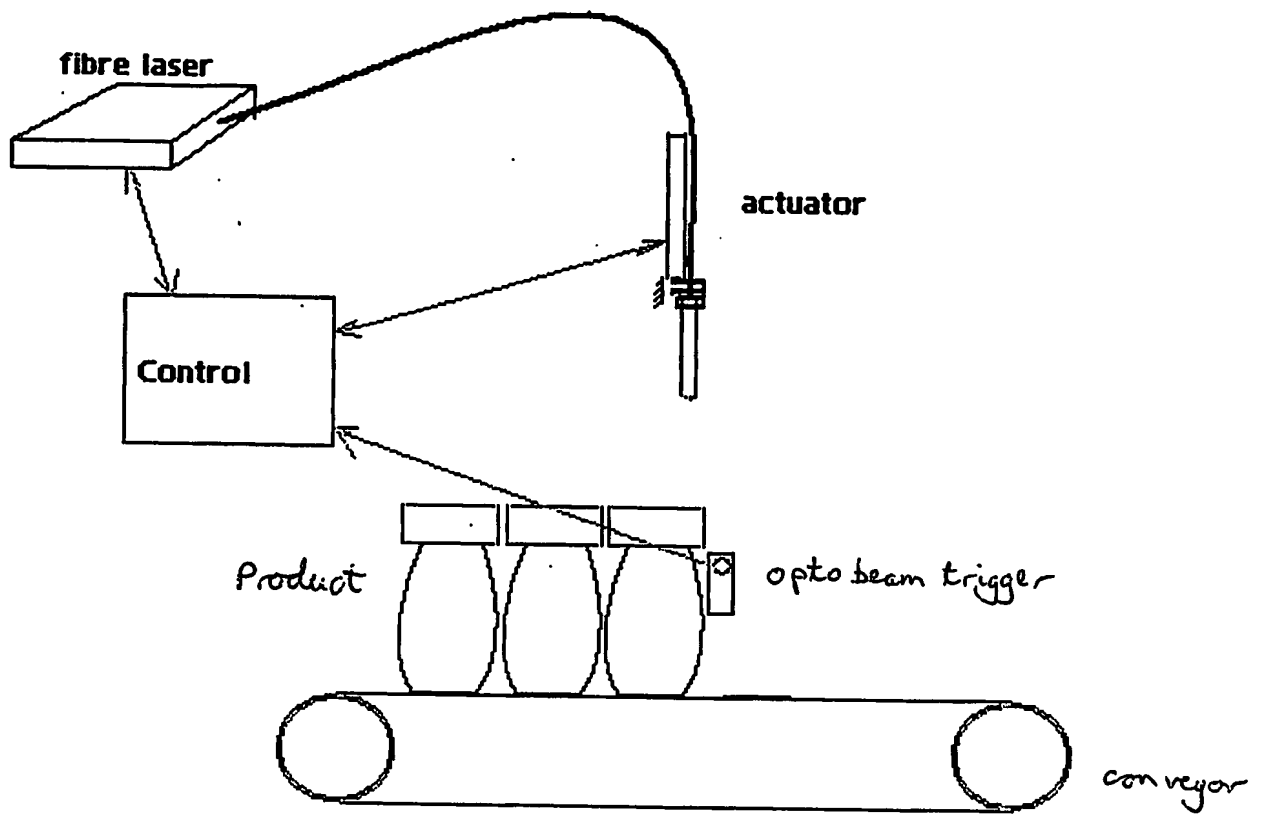
Monitoring at the marking point can be done by tapping off reflected light from the fibre power feed. Use wavelength dependant coupler to separate out combustion light from beam power.

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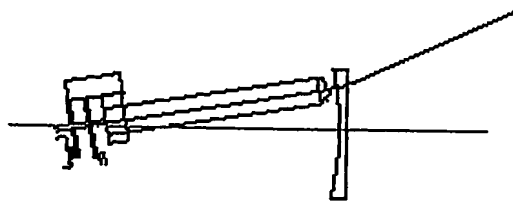
claims:

- 1 Non galvo scanned beam marking (fibre or free space source).
- 2 As 1 with fibre laser source
- 3 As 1 with waggly collimator
- 4 As 1 with moving lens
- 5 As 1 with moving fibre behind lens
- 6 As 1 with piezo driven mirror, two successive 1D actuated mirrors or single 2D actuated mirror
- 7 As 1 with thermo electric actuator
- 8 Motion compensated vector graphics
- 9 Pre emphasis on drive electronics to correct for scanner response
- 10 Changing scan speed to give gaps in characters
- 11 Non galvo beam steering
- 12 No need for beam correction lens cos beams so fat.
- 13 Resolution enhanced from gaussian beam so that only writes in centre – low na beam, compact , large depth. Adjust scan speed / beam power to keep centre beam power density the same.
- 14 Marking system with energy always in fibre (with/without collimator).
- 15 Adaptive marking system with monitor, including feedback to set laser power or scan rate to cope with different surfaces, beam diameters, ageing.
- 16 Use above to check/ calibrate gain of actuator, correct for target distance.....
- 17 Marking system featuring converging lens for parallel beam, constant size characters
- 18 Diverging lens for increased waggle from waggly collimator systems.
- 19 “burn detector”
- 20 Monitoring above via fibre
- 21 As 1, with in line Scan head < 1 cm diameter

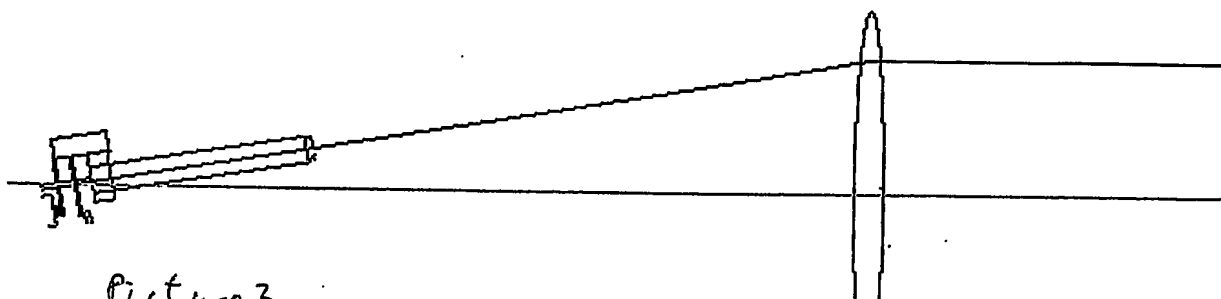
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Picture 1



Picture 2



Picture 3